

**International Genetically Engineered Machine Competition
Team UChile-OpenBio**

Planning and Description document for iGEM 2015 Team participation

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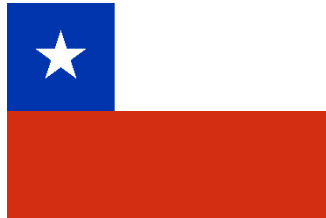
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PROPOSAL CONTENT

El objetivo de este documento es mostrar una visión general acerca de la competencia iGEM, el Equipo & Proyecto UChile OpenBio, y definir las oportunidades y actividades que el equipo realizará en septiembre 2015 durante iGEM Giant Jamboree y visita a la ciudad de Boston. Consideramos participar en este evento de relevancia mundial como parte de una estrategia formativa que el propio equipo UChile OpenBio ha definido con el objetivo de vincular su quehacer científico con una de las ciudades potencia a nivel mundial en ciencia y tecnología y particularmente en lo que ha Biología Sintética respecta. Reconocemos el valor formativo que tiene para los miembros de nuestro equipo competir y cooperar con las más diversos y numerosos centro de investigación del mundo. Apreciamos el hecho de que este evento sea realizado en Boston, E.E.U.U, donde se hallan las universidades de mayor impacto científico-tecnológico a lo largo de la última historia. Visualizamos una oportunidad para que los miembros del equipo puedan relacionarse directamente con empresas de biotecnología, sobre todo por el hecho de que Boston es considerada una ciudad incubadora de empresas de Biología Sintética. Esperamos por tanto tener una importante cercanía al modo en que se hacen las cosas en EEUU, en materia de emprendimiento, innovación y educación, con un especial énfasis en el contexto histórico que condujo a Boston a ser cuna de la revolución norteamericana y conocer cómo hasta el día de hoy la influencia de la ciudad dirige el presente y el futuro de la nación en aspectos diversos, y fundamentalmente en la que es considerada la ciencia del siglo XXI, la Biología Sintética. Creemos fundamental enriquecer a los miembros de nuestro equipo con la cultura pasada, presente y futura de la ciudad de Boston dado su contexto histórico e influencia en la nación de EEUU, observando y admirando similitudes y diferencias con Chile. Por tanto, estamos seguros que esta oportunidad contribuye a fomentar la relación entre Chile y Estados Unidos sobre todo si se considera que el equipo es también patrocinado por el Gobierno de Chile a través del Ministerio de Educación, a quienes será reportada esta participación.

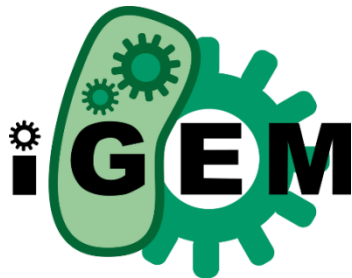


The goal of this document is to show an overview about iGEM competition, our team & the project developed by UChile OpenBio. We go over the different opportunities and activities that team will be doing at iGEM Giant Jamboree and our visit to Boston. We consider participating in this event of global significance as part of a training strategy, in which the team UChile OpenBio will visit one of the greatest powers in the world in science and technology, particularly in the area of Synthetic Biology. We recognize the professional value for our members to compete and cooperate in the most diverse research center in the world. We appreciate the fact that this event is held in Boston, USA where most universities focused on science and technology are. We envision an opportunity for our team members to interact directly with biotechnology companies, especially due to the fact that Boston is considered an incubator of companies focused on Synthetic Biology. We hope therefore have a new approach and understanding of the way things are done in the US, particularly regarding entrepreneurship, innovation, education. We are also specially interested in the historical context which led to Boston to be the birthplace of the American Revolution and how the city is today a place where the future of nation is being developed in many ways. Mainly in what is considered the science of XXI century, Synthetic Biology. We hope to learn about the past, present and future culture of the city of Boston given its historical importance and the influence in the US nation watching and admiring similarities and differences with Chile. Therefore, we are sure that this opportunity helps promote the relationship between Chile and the United States. The Chilean government, through the Ministry of Education, will be reported of this participation and we hope it will strengthen the bond between the two countries.



1. INTERNATIONAL GENETICALLY ENGINEERED MACHINE COMPETITION

1.1 IGEM FOUNDATION



www.igem.org

The International Genetically Engineered Machine (iGEM) Foundation is an independent, non-profit organization dedicated to education and competition, the advancement of synthetic biology, and the development of an open community and collaboration.

iGEM runs three main programs: 1) the iGEM Competition - an international competition for students interested in the field of synthetic biology; 2) the Labs Program - a program for academic labs to use the same resources as the competition teams; and 3) the Registry of Standard

Biological Parts - a growing collection of genetic parts use for building biological devices and systems.

1.2 SYNTHETIC BIOLOGY

The goal of Synthetic Biology is the application of engineering principles to biological entities. The www.syntheticbiology.org website has the following definition: A) the design and construction of new biological parts, devices and systems. B) the re-design of existing, natural biological systems for useful purposes.

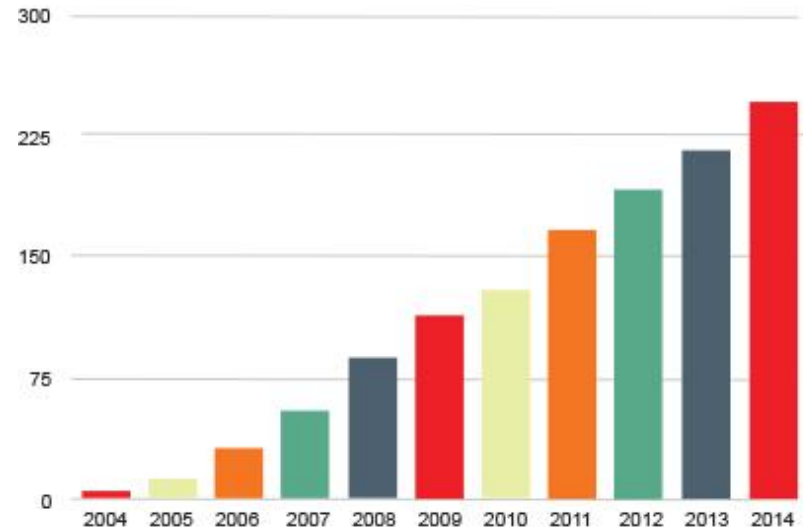


www.ontariogenomics.ca ©

1.3 RELEVANCE

iGEM began in January 2003 as an independent study course at the Massachusetts Institute of Technology (MIT) where students developed biological devices to make cells blink. This course became a summer competition with 5 teams in 2004 and continued to grow to 13 teams in 2005; it has now expanded to 280 teams in 2015, reaching over more than 30 countries.

The competition was originally aimed at college students but it has grown to include overgraduate and high school students. The competition's projects also grew in complexity. Tracks were introduced to the competition to give teams focus areas for their projects and Regional Jamborees and World Championships were held in the past. Past projects have ranged from a rainbow of pigmented bacteria, to banana and wintergreen scented bacteria, to the development of an arsenic biosensor to screen drinking water.



Growth of teams from 2004 to 2014.

2. GIANT JAMBOREE

The iGEM Giant Jamboree is the annual event where all of the collegiate and high school iGEM teams come together to present their synthetic biology projects. This year, the Hynes Convention Center, located in historic Boston, MA, will host more than 260 international, multidisciplinary teams eager to share and celebrate their work.



At September 24 – 28. Hynes Convention Center. 900 Boylston Street
Boston MA 02115.

The iGEM competition is an annual, worldwide, synthetic biology event aimed at undergraduate university students, as well as high school and graduate students. Multidisciplinary teams work all summer long to build genetically engineered systems using standard biological parts called Biobricks. iGEM teams work inside and outside the lab, creating sophisticated projects that strive to create a positive contribution to their communities and the world.

The iGEM Competition is the premiere student competition in Synthetic Biology. Since 2004, participants of the competition have experienced education, teamwork, sharing, and more in a unique competition setting. iGEM is also much more than a competition; our community has a long history of involving students and the public in the development of the new

field of synthetic biology. With 15 tracks available, there is something for everyone!

The iGEM competition encourages university and high school student researchers to work in teams and solve real-world challenges by building genetically engineered biological systems with standard, interchangeable parts called BioBricks from the Registry of Standard Biological Parts. Each team manages their own projects, advocates for their research, and secures funding. Teams are also challenged to actively consider and address the safety, security and environmental implications of their work.

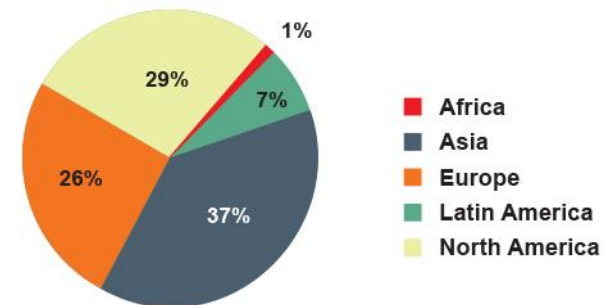
All International Genetically Engineered Machine (iGEM) Competition participants are invited to the Giant Jamboree to present their accomplishments and compete in front of a global audience.

2.1 SKILLS DEVELOPED/PRACTICED IN IGEN

iGEM is a multifaceted program in which students can develop new skills. The different components of the competition not only make it a strong and thorough program but also allow students to be involved in education and outreach, new technologies, an international community, safe research practices, project design, and scientific responsibility.

- Project planning and administration
- Resource and team management
- Fundraising
- Team work
- Problem based knowledge

- International networking
- Entrepreneurial thinking
- Collaboration
- Responsible science and engineering
- Safe lab work and project design
- Presentation skills
- Scientific communication



2.2 IGEM AROUND THE WORLD

iGEM is a truly international event with teams coming from all over the world. The United States, Canada, Chile, Kazakhstan, Japan, South Korea, Egypt, South Africa, Mexico, Brazil, Germany, France, and Australia are only some of the countries that will participate in iGEM 2015.

Particularly, Chile has 5 registered teams in 2015; University of Chile (Santiago), University of Adolfo Ibáñez (Viña del Mar), San Andrés School (Maipú), Emilina Urrutia School (Talagante) and Eugenio María de Hostos School (La Reina).

This year, it has 280 registered teams from the following regions: 3 from Africa, 104 from Asia, 72 from Europe, 22 from Latin America and 81 from North America. The percentage for each region is seen in the graph.



3. SPECIAL EVENTS AT THE GIANT JAMBOREE

The iGEM Giant Jamboree will offer various special events (workshops) to attend, depending of interest of the members teams.

3.1 HOW TO NAVIGATE THE IGEM COMPETITION SEASON

Description: Come and learn from iGEM veterans and mentors. Hear stories from mentors who have years of iGEM experience!

Team expectations: We are the first iGEM team of our University, so this event could be a great moment to learn from experts to bring back their knowledge to Chile and other experience tips.

3.2 HOW TO ADVOCATE FOR FUNDING AND GARNER SUPPORT FOR OUR IGEM PROJECT

Description: There is wide range of funding opportunities for iGEM teams and synthetic biologists. Come hear advice from funders around the world and from various types of sources. From federal funding to crowd funding, there are many ways to fund your next iGEM team and beyond as you continue your work in synthetic biology.

Team expectations: Funding has been an important part of our process. If we know new funding opportunities we would be able to advise next iGEM teams of our University or of Chile in general to achieve their goals.

3.3 CAREER DEVELOPMENT SERIES

Description: This Career Development series will include a Career Fair focused in the Synthetic Biology industry and Networking Bingo, a fun and interactive way to meet and connect with event attendees.

Team expectations: This event will be useful to know about Synthetic Biology industry and to make networking with other teams to keep in contact for future collaborations.

3.4 NEW TRACK WORKSHOPS

Description: This series includes sessions for each of our new tracks: Art and Design, Community Labs, Hardware, High School, Measurement, and Software.

Team expectations: this event could be a great moment to meet new tracks to promote it in new iGEM teams of Chile.

3.5 IGEM TECHNICAL SERIES

Description: This Technical series will include sessions on 'Assembly in iGEM', 'Mammalian

Synthetic Biology' and 'Plant Synthetic Biology'.

Team expectations: At this workshop we could learn new and specific methodologies of Synthetic Biology that could be implemented in new projects.

3.6 IGEM STARTUP SHOWCASE

Description: Celebrate the entrepreneurial spirit of iGEM. Join us for lightning talks followed by a panel discussion and Q & A session. Bring your questions, and learn from the experts on how to take your project and idea to market.

Team expectations: this event will provide capacities to our team in entrepreneurship and innovation subjects.

3.8 IGEM HALL OF FAME

Description: An iGEM Community Workshop: Topics include: iGEM throughout the years and AlumniGEM mentorship.

Team expectations: We could know about history of iGEM and its relevance like an educational platform where we could participate like a mentorship in some years.

3.9 POLICY AND PRACTICE

Description: Policy and Practices Showcase to highlight excellence from previous years' policy and practices projects.

Team expectations: in this event we could learn and compare the impact of our project with other in policy and practice subjects (social, cultural, ethical, philosophical, environmental, political, legal and/or economic dimensions of synthetic biology)

3.10 MULTI-OMICS SOLUTIONS FOR SYNTHETIC BIOLOGY WORKFLOWS

Description: Learn more about Agilent's broad portfolio of solutions and tools in molecular biology, analytical instrumentation, as well as bioinformatics solutions for data analysis and integration that enable researchers to overcome challenges in their workflows from discovery, through the engineering cycle, to the final bioprocess. Hosted by Agilent.

Team expectations: this would be a great opportunity to know tools and solutions that are offered by the Agilent Company.

3.11 A SYNTHETIC BIOLOGY APPROACH TO NOVEL MOLECULAR BIOLOGY

Description: Join us to see emerging technologies that accelerate the design, build, test, and analyze cycle. See how free SureVector kits are being used by iGEM Teams! Up to 3 Teams will be chosen to speak

about their use of SureVector in their projects. Hosted by Agilent.

Team expectations: a specific workshop that shows how to use the SureVector kits which allows to combine standard DNA components to build customized vector construct. It would be useful to a next iGEM team.

3.12 DESIGN AND RUN EXPERIMENTS IN AUTOMATED LABS

Description: At Autodesk, we have been working on tools to accelerate scientific discovery. In this workshop, we will explore visual tools to create, execute and analyze automated lab experiments. Hosted by Autodesk.

Team expectations: Autodesk is a leader in 3D design, engineering and entertainment software. This workshop will give us a complementary way of how to interpret lab experiments.

3.13 SAFEGUARDING SCIENCE AND THE FUTURE

Description: Meet with the FBI and participate in a discussion on the shared responsibility to protect the life sciences as a member of law enforcement or the synthetic biology community (whether you're an iGEM'er, scientist, biohacker, investor, business person, or all of the above). Find out what it means to be a guardian of science. Hosted by FBI.

Team expectations: this meet would be a great opportunity to directly know FBI work on science subjects, particularly in synthetic biology which would permit to design new life forms in the future; useful and/or harmful.

3.14 MODELING BIOLOGY WITH SIMBIOLOGY

Description: Using synthetic biology examples, we will demonstrate key features of SimBiology, a MATLAB based modeling tool. Including: block diagram model building environment, model exploration methods, including sensitivity analysis, parameter estimation techniques and advanced analysis via custom analysis tasks written in MATLAB. Hosted by MathWorks.

Team expectations: In our university, we used to use MATLAB software to simulate problems. Learning how to use SimBiology will be a complementary tool that could be used in different biotechnology projects or investigations.

3.15 PAVING THE WAY TO GRAD SCHOOL

Description: This workshop gathers together wisdom from students, professors, and admissions experts to help you to apply to graduate programs at U.S. research institutions. Learn what you need to do to gain acceptance into your dream school! Hosted by Synberc.



Team expectations: this workshop would be an opportunity to learn how to apply to graduate programs of interest at U.S research institutions to continues our studies in a next level.

3.16 SYNTHETIC DANCEOLOGY

Description: In this workshop, a professional dancer and a scientist will work with iGEM teams to translate their projects into a dance. Participants will explore synthetic biology in a fun way that reinforces learning, sparks questions and promotes interaction. Hosted by Synberc.

Team expectations: this would be an artistic way of how to understand-interpret synthetic biology.

3.17 SYNBIO AT SCIENCE MUSEUMS

Description: Partnering with 200 science museums across the U.S., "Building with Biology" is creating hands-on activities to engage the public about synthetic biology and its impacts. Come try out these activities and learn how to get involved! Hosted by Synberc.

Team expectations: it would be an event to know notions of how we could engage public about synthetic biology and its impacts in Chile.

3.18 TAKING SYNBIO VISIONS TO THE NEXT LEVEL

Description: How will SynBio change the world around us, and how can we prepare for it? How do we respond to moral dilemmas and enhance opportunities for the public good? The workshop will discuss techno-moral scenarios developed by iGEM teams based on their projects, together with experts from various fields. Hosted by SYNENERGENE.

Team expectations: this workshop will be a good activity to wonder us the future impacts of synthetic biology. Bringing back this knowledge to Chile would be very useful in future analysis and regulations in biology (GMO) subjects.



4. SPECIAL SITE VISITS IN BOSTON

4.1 VISITING IGEM FOUNDATION

An iGEM Foundation visit will be a great opportunity to meet and learn where and how the foundation is dedicated to promote education and competition, advancement of synthetic biology, and the development of open community and collaboration.

4.2 VISITING BIOLOGY INSTITUTIONS

Before iGEM Giant Jamboree we want to coordinate a Biology Institutions visit like:

- Department of Systems Biology, Harvard University: Systems Biology Tuesday Pizza Talks are a way for Systems Biology Post Docs & Graduate Students to present their work and receive feedback in a casual setting. Held on selected Tuesdays at 12:30pm in Warren Alpert 563. For more information contact Shauna Barbosa.
- To meet the Synthetic Biology Center at MIT. It is to develop and advance the engineering discipline for this emerging field. In 500 Technology Square, NE47-257 Cambridge, MA 02139. For more information contact Domitilla Del Vecchio.
- Gingko Bioworks company (a spin out of MIT) which has the mission to make biology easier to engineer. 27 Drydock Ave, Boston, MA.
- Broad Institute

4.3 BOSTON IN THREE DAY SIGHTSEEING TOUR

We expect to learn the very best of Boston's history in three day on a sightseeing tour of the area's major sights. First, journey through the historic towns of Cambridge, Lexington and Concord to visit Harvard Square, stand

on the Lexington Battle Green, and follow the Battle Road Trail -- the route that Paul Revere took and where the Minutemen fought for freedom against the British during the American Revolutionary War. Then, tour Boston to see sights including Beacon Hill, the West End, the Seaport District and the site of the Boston Massacre. We'll also spend time at Faneuil Hall Marketplace and the USS 'Constitution.' This tour would be guided by a representative buddy of iGEM Foundation.

We present a general overview of what we'll find in central neighborhoods, districts, and areas, plus Cambridge (a separate city) across the Charles River. **We will visit places according to a previous planning and distributing of the team. For example:**

Boston Common / Public Garden

These two iconic parks form the heart of the city. Perfect place to begin our sightseeing

Beacon Hill

Gas lights, narrow streets, excellent restaurants, boutiques, and 19th century mansions and row houses - the most historically preserved neighborhood in the city.

Historic Downtown / Faneuil Marketplace

The oldest part of the city, filled with Freedom Trail sites, Faneuil Marketplace, and historic taverns, including one where the Sons of Liberty met to plot the American Revolution.

Theatre District

Over a dozen thriving theaters, restaurants, and Emerson College make this one of our most vibrant neighborhoods.

Bay Village / Park Square

A tranquil mostly-residential area with Federal and Art Deco architecture - one of Boston's "hidden secrets".



Chinatown / Leather District

Restaurants, markets, and boutiques, bordered by trendy condos carved from former tanneries.

Downtown Crossing / Financial District

Primarily a commercial area, with pedestrian-only shopping along Washington Street and financial firms filling the skyscrapers

Downtown Waterfront

Luxury hotels and nice restaurants share space with wharfs and departure points for Harbor cruises

Back Bay

Designer boutiques, art galleries, skyscrapers, but also home to Romanesque Revival Trinity Church and Boston Public Library in Copley Square, and breath-taking Victorian mansions and brownstones.

Fenway

Sports, culture, colleges and universities, nightlife, and medical centers compete for space in Fenway. Includes commercially-oriented Kenmore Square and Longwood Medical Area.

West End

Site of massive urban renewal during the 1960s, the mostly new West End includes Government Center, world-famous medical institutions, and plenty of entertainment / cultural options.

Charlestown

One of the oldest Boston neighborhoods, with famous Freedom Trail sites, antique shops, lots to see and do in the historic Navy Yard, and one of our oldest taverns.

Boston Harbor

Once your boat pulls away from the wharf, you're in another world, full of history, fascinating sights, and marine life.

Cambridge

A separate city directly across the Charles River from Boston - home to Harvard University and MIT, boutiques and bookstores in Harvard Square, lots of ethnic restaurants, and top-notch live music in the many student-oriented bars.

5. CALENDAR

	MONDAY 21	TUESDAY 22	WEDNSDAY 23	THURSDAY 24	FRIDAY 25	SATURDAY 26	SUNDAY 27	MONDAY 28	TUESDAY 29		
MORNING		Arrive			Presentation Sessions*			Awards Ceremony	Visiting iGEM Foundation		
NOON			Lunch	Lunch	Lunch & Special Events			Lunch	Lunch		
AFTERNOON			Boston in Three Days	Registration	Practice Sessions	Presentation Sessions*			Visiting Biology Synthetic Centre	Visiting Biology Synthetic Centre	
	Special Events										
	Poster Sessions										
EVENING	Travel							Social Events	Instructor Social Event	Boston in Three Days	Boston in Three Days

*Presentation Session will take place in 7 different rooms at the same time.



6. TEAM OVERVIEW

5.1 DESCRIPTION

UChile OpenBio is a multidisciplinary young students group of University of Chile, seeking to boost the development of synthetic biology with a view to fostering innovation and research within a collaborative network and OpenSource in science and technology for Chile.

5.2 TEAM MEMBERS

The team consists of 11 students from the University of Chile.



Luis Rodríguez
Biotechnology Engineering (c)
Team Coordinator



José Duguet
PhD Chemical Engineering (c)
Laboratory Coordinator



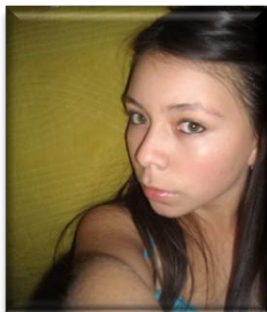
Diego Lagos
MSc. Chemical Engineering (c)
WIKI Coordinator



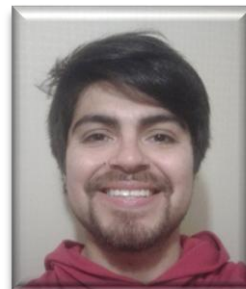
Séverine Casaux
Biotechnology Engineering (c)
Human Practices Coordinator



Javiera Gómez
Biotechnology Engineering (c)
Content Generation Coordinator



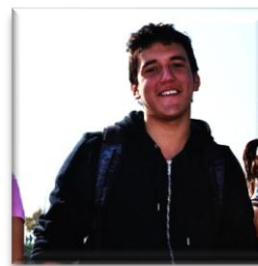
Natalia Urtubia
Industrial Design
Design Coordinator



Héctor Ampuero
Chemical Engineering (c)
Bioreactor Design Coordinator



Anariky Negrete
Biotechnology Engineering (c)
Metabolic Model Coordinator



Ignacio Ardiles
Industrial Engineering (c)
Financial Coordinator



Gustavo Calvo
Molecular Biotechnology
Engineering (c)
Funding Coordinator



David Sepúlveda
Biotechnology Engineering (c)
Communications Coordinator



5.3 TEAM SUPPORTS



SIGMA-ALDRICH®



**FON
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RA**

The team already relies on the support of various institutions.

7. SYNTHETIC BIOLOGY PROJECT DESCRIPTION

7.1 OVERVIEW: FIGHTING AGAINST PLASTIC POLLUTION THROUGH SELF-REGULATED PRODUCTION OF A BIODEGRADABLE PLASTIC

Each year, 130 million tons of fossil plastics are produced in the world, which take 500-1000 years to degrade, and pollute the environment; 1,5 millions of marine animals were killed in 2014. A sustainable initiative is to produce biodegradable plastics; however its synthesis process (chemical and biological) is complex and expensive. The team UChile-OpenBio is designing two populations of Bacteria to achieve this: *Escherichia coli* to produce a biodegradable plastic called PLA (Polylactic acid) from easy to assimilate renewable resources. The first population will convert glucose into lactate and will self-regulate its production by sensing the pH. The second population will polymerize lactate into PLA and will export it into the medium. In addition the team is planning to replace the glucose by Chilean brown macroalgae (kelp), a renewable resource to sustainably produce PLA. In this way, the team would help fighting against pollution, contributing to a better world!

7.2 BACKGROUND

Each year, 130 million tons of plastics[1] are produced, which take between 500 to 1000 years [2] and are responsible for the death of 1,5 millions of marine animals all around the world [3]. This corresponds to a Chilean waste of up to 25 thousand tons thrown into the ocean, where it can be brought back to the coast, sunk or accumulated near the Easter Island. [4] In Chile, the government generated a proposal of law to forbid using supermarket bags made of polyethylene, polypropylene and other artificial polymers which are non-biodegradable, which was accepted in the Patagonian territory last year. [5]



Representation of plastic contamination in the sea. (ecologiaverde.com).

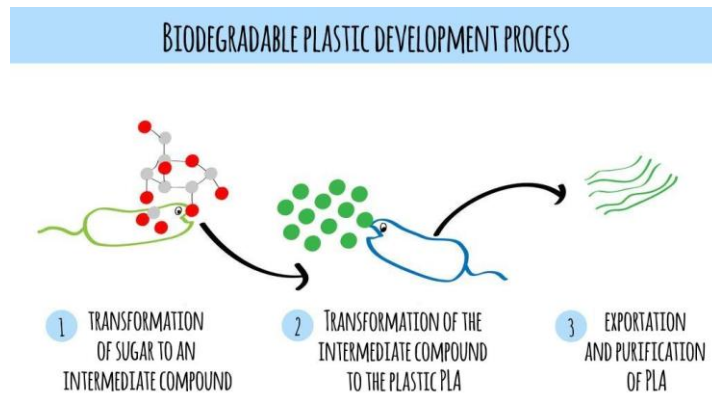
Fossil plastic contamination is not a new issue and several ways to reduce it have been explored. However, actions like recycling are not viable solutions, knowing that only up to the 30% of plastic produced is actually reused. [6] A more sustainable initiative is to produce biodegradable plastics, made of renewable resources such as brown macroalgae in our case: their degradation time can only be of two years in the case of the PolyLactic Acid (PLA) and their physical properties are very similar to the classic plastic ones. [7] Nevertheless, the current synthesis, essentially driven by chemical reactions, is quite expensive since the process requires complex experimental conditions, for instance the absence of any trace of water, which raises the production costs.[2] Our challenge, consists in making the biodegradable plastic production cheaper, and develop a different gave birth to another way to synthesize them: using microorganisms. Indeed, as it has been observed for insulin, microorganisms have a great production capacity.[8] Several scientific studies already began to produce a bioplastic, PHB, with genetically modified bacteria.[9] The main difficulty resides in finding a way to export the bioplastic outside the cell. Indeed, the recovery of cell products is a difficult and expensive

challenge. Considering all these elements, the team UChile-OpenBio wants to reach, in the long term, the implementation of a secretory biological production of PLA from a renewable resource, the brown macroalgae, which is located on the Chilean coasts. To do that, the first step consists in designing and testing the biological system using a simple sugar: the glucose. In this way, the team would help fighting the contamination due to fossil plastics.

7.3 MAIN GOAL

For the iGEM competition, the team aims to engineer a biological system, enabling it to degrade glucose in order to produce and export into the medium a biodegradable plastic called PLA.

7.4 THE PROJECT



A scheme representing the general process of our system.

The team will start with the proof of concept, consisting in programming two populations of *Escherichia coli* to produce PLA from glucose. In a few words, the first population (in light green) will convert the glucose into the intermediate lactate, which will be processed by the second population (in blue) to polymerize it into PLA.

The team is also implementing a pH-sensing system which will allow the bacteria to control the lactate production: the higher the intermediate concentration, the lower the pH, which induces a negative control in the first population of *E.coli*, stopping the production of lactate. The second population of bacteria will possess an exportation system that would enable it to send the biologic PLA outside the cells, into the medium. This way, the purification of the bioplastic is easier. To ensure the safety of the people working in the laboratory and of the environment, the team designed a safety system which consists in making arabinose-dependent the cell survival: while the bacteria grow up in laboratory conditions, defined by the presence of arabinose into the medium, the safety system is shut down. If the bacteria escape from their medium, the safety system won't be turned off and the cells will produce a toxin which will kill them.

7.5 POTENTIAL IMPACT

Advantages

- Fossil plastics could be replaced in the long term by biodegradable plastics such as PLA, ending up with the environmental contamination associated to it.
- In the medical field, PLA is effectively used to manufacture human prothesis.
- Digital fabrication laboratories could have better access to their feedstock (the PLA) which could promote the fabrication of Open Tools and the society empowering.

➤ Disadvantages

- The team does not currently know what will be the nature of the produced PLA nor how will bacteria react to the genetic modifications that have been made, so at least two consequences should be considered:

- 1) The biologic production of the PLA can lead to a non-usable bioplastic (physical state, purity, properties).
- 2) Every engineered biological system presents some environmental risks and must be controlled by safety rules. However it is difficult to have a complete control over the biological system, even with the safety system implemented (any aleatory mutation could inhibit it).

7.6 FUTURE PROSPECTS

As said before, the project presented for the iGEM competition is a proof of concept: the team aims to bring the project beyond the academic field by changing the feedstock to a more sustainable one, the brown macroalgae (kelp).



8. COMMITMENTS

8.1 MOMENTUM AND COMMITMENT

We believe that our visit to the United States is essential to consolidate the team OpenBio UChile as part of a collaborative research network focused on synthetic biology. We have made commitments to the team and our partners throughout the time period. We understand this instance as an opportunity to acquire new knowledge in different areas of synthetic biology and we are committed to bring it back to our country to create new lines of inquiry, and strengthen our existing ones on the subject.

We think if whole team attends the competition, the experience is enriched, because as a multidisciplinary team we expect to adopt and bring different perspectives and skills. We also understand that from this team the future instructors iGEM teams from University of Chile will come and, why not, other institutions. This is why, as a team we are committed to working with the next generation interested in participating in the iGEM competition, sharing with them the knowledge gained in the enriched experience.

Finally other ways to transfer the knowledge gained from the event is through talks at University of Chile and participation in science fairs that take place during the “Week of Engineering and Science” at our university.



Luis and Javiera at right in a DNA extraction workshop during the Second Festival of Engineering and Science at University of Chile, October 2014.



Members of iGEM Team UChile-OpenBio working, June.

9. TEAM BUDGUET

TOTAL EXPENSES FOR 9 MEMBERS OF THE TEAM (21/09/2015 - 29/09/2015)

Summary	Total
Total expenses (USD)	\$ 24,037.13
Funded Expenses (USD)	\$ 17,605.10
Unfunded Expenses (USD)	\$ 6,432.03

Quote made 07/20/2015	Unit price (USD)	Units	Sub-Total	State
(1) iGEM Event				
Fee	\$ 695.00	6	\$ 4,170.00	Funded
Fee after 31 de Julio 2015	\$ 795.00	3	\$ 2,385.00	Funded
Official clothing	\$ 30.00	10	\$ 300.00	Funded
Total iGEM Event			\$ 6,555.00	

(2) Transportation				
Plane Tickets (main team) to Boston , USA	\$ 875.00	7	\$ 6,125.00	Funded
Plane Tickets (support team) to Boston, USA	\$ 962.00	2	\$ 1,924.00	Funded
Airport Transfer	\$ 25.00	18	\$ 450.00	Unfunded
Subway weekly Ticket	\$ 19.00	9	\$ 171.00	Unfunded
Total Transportation			\$ 8,670.00	

(3) Accommodation				
Reservation 1 Standard Double shared bathroom, 40 Berkeley	\$ 165.96	1	\$ 165.96	Funded
6 nights on 1 Standard Double shared bathroom, 40 Berkeley	\$ 1,030.08	1	\$ 1,030.08	Funded
Reservation 1 Standard Double shared bathroom, 40 Berkeley	\$ 165.96	1	\$ 165.96	Funded
6 nights on 1 Standard Double shared bathroom, 40 Berkeley	\$ 1,030.08	1	\$ 1,030.08	Unfunded
Reservation 1 Standard Double shared bathroom, 40 Berkeley	\$ 154.51	1	\$ 154.51	Funded
6 nights on 1 Standard Double shared bathroom, 40 Berkeley	\$ 1,001.47	1	\$ 1,001.47	Funded
Reservation 1 Standard Triple shared bathroom, 40 Berkeley	\$ 183.12	1	\$ 183.12	Funded
6 nights on 1 Standard Triple shared bathroom, 40 Berkeley	\$ 1,155.95	1	\$ 1,155.95	Unfunded
Total Accommodation			\$ 4,887.13	



(4) Others				
Alimentation*	\$ 405.00	9	\$ 3,645.00	Unfunded
Business Cards	\$ 0.30	100	\$ 30.00	Unfunded
Networking	\$ 125.00	2	\$ 250.00	Unfunded
Total Others			\$ 3,925.00	

9.1 BUDGET BREAKDOWN

(1) Fee After 31 jul raises its price to 795.

(2) Airplane travel budget made on 21-Jul-2015. It is expected they increased 10% to 962 USD each one at this moment.

(3) Accommodation payments are split: reservation payment equal to the first day of accommodation and next six days must be paid the check-in date. Accommodation does not provide breakfast.

(4) Others expenses considers accessorial items like networking or business cards which are dispensable. Official clothing and alimentation are the most important items in this category.

* Alimentation Unit price considers 3 meals for 9 nine days for each person. Considering a fast casual restaurant segment with an average ticket price of 15 dollars per meal.

10. CONCLUTIONS AND USA EMBASSY APPLY

UChile-OpenBio has generated this Planning and Description document for iGEM 2015 to apply for financial resources to cover any part or all of the unfunded budget team. We consider participating in this event of global significance as part of a training strategy, in which the team UChile OpenBio will visit one of the greatest powers in the world in science and technology, particularly in the area of Synthetic Biology. We appreciate the fact that this event is held in Boston, USA where most universities focused on science and technology are. We envision an opportunity for our team members to interact directly with biotechnology companies, especially due to the fact that Boston is considered an incubator of companies focused on Synthetic Biology. We are also specially interested in the historical context which led to Boston to be the birthplace of the American Revolution and how the city is today a place where the future of nation is being developed in many ways. Therefore, we are sure that this opportunity helps promote the relationship between Chile and the United States. The Chilean government, through the Ministry of Education, will be reported. We thanks to USA Embassy in Chile for accept this presentation, and we hope you can found in our team a opportunity for strengthen the country's prosperity. We are confident that we will be generating a sponsorship opportunity that converges to strengthen ties between the United States and Chile as part of a productive and mutually beneficial relationship.



10. REFERENCES

1. El Banco Mundial, 2014. Una bolsa de plástico para asfixiar el mar. [online] <<http://www.bancomundial.org/es/news/feature/2014/12/08/bolsa-de-plastico-asfixiar-planeta>> [consulted: 14-07-2015]
2. Garlotta, 2002. A Literature Review of PolyLactic Acid. Journal of Polymers and the Environment, Vol. 9, No. 2.
3. El Tiempo, 2014. Plásticos matan al año 1,5 millones de animales marinos. [online] <<http://www.eltiempo.com/estilo-de-vida/ciencia/muerte-de-animales-por-plasticos-lanzados-al-mar/14710998>> [consulted: 14-07-2015]
4. La Tercera, 2015. Cristina Espinoza. Hasta 25 mil toneladas de plástico anuales se arrojan al mar desde Chile. [online] <<http://www.latercera.com/noticia/tendencias/2015/05/659-627978-9-hasta-25-mil-toneladas-de-plasticos-anuales-se-arrojan-al-mar-desde-chile.shtml>> [consulted: 14-07-2015]
5. Chilean Senate, 2014. [online] <http://www.senado.cl/prohibicion-de-bolsas-plasticas-en-la-patagonia-votaran-idea-de-legislar/prontus_senado/2014-10-23/122842.html> [consulted: 14-07-2015]
6. PlasticsEurope. Plásticos - Situación en 2011. Análisis de la producción, la demanda y la recuperación de plásticos en Europa en 2010. [online] <http://www.plasticseurope.org/documents/document/20111107102611-pe_factsfigures_es_2011_lr_final041111.pdf> [consulted: 15-07-2015]
7. Serna et al. Ácido Poliláctico (PLA): Propiedades y Aplicaciones. Ingeniería y Competitividad (2003), Vol.5, 16-26.
8. Jong et al. Production of recombinant proteins by high cell density culture of Escherichia coli. Chemical Engineering Science (2006). Vol. 61, Issue 3, 876–885.
9. Mahishi et al. Poly(3-hydroxybutyrate) (PHB) synthesis by recombinant Escherichia coli harbouring Streptomyces aureofaciens PHB biosynthesis genes: Effect of various carbon and nitrogen sources. Microbiol. Res. (2003) 158, 19–27